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CLAIMS

What is claimed is:

1. A long chain crosslinked elastomeric composition of matter comprising:

5 100 parts by weight of a rubber selected from the group consisting of polybutadiene, styrene-butadiene rubber, synthetic *cis*-1,4-polyisoprene, synthetic polyisoprene, *cis*-polybutadiene, butadiene-isoprene rubber, styrene-isoprene rubber, styrene-isoprene-butadiene rubber, butyl rubber, neoprene, acrylonitrile-butadiene rubber, natural rubber, EPDM, terminal and backbone functionalized derivatives thereof, and mixtures thereof;

10 from about 1 to about 15 parts by weight of a difunctional crosslinking agent, per 100 parts by weight of the rubber, having the structure $Y_m(SRS)_nY_m$ where Y is selected from the group consisting of H, SR' and SiR'_3; where R is selected from the group consisting of branched and linear C2 to C20 alkylene, C6 to C20 arylene, C7 to C20 alkyarylene and C4 to C20 cycloalkylene groups and R"XR"; where R' is selected from the group consisting of branched and linear C1 to C10 alkyl, C6 to C10 aryl, C7 to C10 alkyaryl and C4 to C10 cycloalkyl groups; where R" is selected from the group consisting of branched and linear C2 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups and R" can be the same or different; where X is selected from the group consisting of O, S, NH, NR' and mixtures thereof; where m is 0 or 1 and n is 1 to about 100;

15 from 0 to 5 parts by weight of sulfur; and

20 from about 0.2 to about 10 parts by weight of at least one accelerator.

25 2. A long chain crosslinked elastomeric composition of matter, as set forth in claim 1, wherein said difunctional agent is a dimercaptan having the general formula



30 where R is selected from the group consisting of branched and linear C2 to C20 alkylene, C6 to C20 arylene, C7 to C20 alkyarylene and C4 to C20 cycloalkylene groups and R"XR" where R" is selected from the group consisting of branched and linear C2 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups; where X is selected from the group consisting of O,

S, NH, NR' and mixtures thereof and where R' is selected from the group consisting of branched and linear C1 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups.

- 5 3. A long chain crosslinked elastomeric composition of matter, as set forth in claim 2, wherein said dimercaptan has the general formula



where n is 2 to 60.

- 10 4. A long chain crosslinked elastomeric composition of matter, as set forth in claim 1, wherein said long chain difunctional crosslinking agent has a molecular weight of about 100 to about 10,000 g/mol.

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15 5. A long chain crosslinked elastomeric composition of matter, as set forth in claim 1, wherein said accelerators are selected from the group consisting of amines, guanidines, thioureas, thiols, thiurams, sulfonamides, dithiocarbamates and xanthates.

- 20 6. A method for making a long chain crosslinked elastomeric composition of matter having long chain polymer backbones and long chain crosslinks, comprising:

incorporating long chains of a difunctional crosslinking agent into a vulcanizable elastomer composition comprising 100 parts by weight of a rubber selected from the group consisting of polybutadiene, styrene-butadiene rubber, synthetic *cis*-1,4-polyisoprene, synthetic polyisoprene, *cis*-polybutadiene, butadiene-isoprene rubber, styrene-isoprene rubber, styrene-isoprene-butadiene rubber, butyl rubber, neoprene, acrylonitrile-butadiene rubber, natural rubber, EPDM, terminal and backbone functionalized derivatives thereof, and mixtures thereof;

30 from about 1 to about 15 parts by weight of a difunctional crosslinking agent, per 100 parts by weight of the rubber, having the structure $\text{Y}_m(\text{SRS})_n\text{Y}_m$ where Y is selected from the group consisting of H, SR' and SiR'; where R is

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selected from the group consisting of branched and linear C2 to C20 alkylene, C6 to C20 arylene, C7 to C20 alkyarylene and C4 to C20 cycloalkylene groups and R"XR"; where R' is selected from the group consisting of branched and linear C1 to C10 alkyl, C6 to C10 aryl, C7 to C10 alkyaryl and C4 to C10 cycloalkyl groups; where R" is selected from the group consisting of branched and linear C2 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups and R" can be the same or different; where X is selected from the group consisting of O, S, NH, NR' and mixtures thereof; where m is 0 or 1 and n is 1 to about 100;

from 0 to 5 parts by weight of sulfur; and
 from about 0.2 to about 10 parts by weight of at least one accelerator; and
 vulcanizing said elastomer composition.

7. A method, as set forth in claim 6, wherein said difunctional agent is a dimercaptan having the general formula



where R is selected from the group consisting of branched and linear C2 to C20 alkylene, C6 to C20 arylene, C7 to C20 alkyarylene and C4 to C20 cycloalkylene groups and R"XR" where R" is selected from the group consisting of branched and linear C2 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups; where X is selected from the group consisting of O, S, NH, NR' and mixtures thereof and where R' is selected from the group consisting of branched and linear C1 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups.

8. A method, as set forth in claim 7, wherein said dimercaptan has the general formula



where n is 2 to 60.

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 9. A method, as set forth in claim 6, wherein said accelerators are selected from the group consisting of amines, guanidines, thioureas, thiols, thiurams,

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cont*

sulfonamides, dithiocarbamates and xanthates.

10. A rubber article manufactured from a long chain crosslinked elastomeric composition of matter comprising:

5 100 parts by weight of a rubber selected from the group consisting of polybutadiene, styrene-butadiene rubber, synthetic *cis*-1,4-polyisoprene, synthetic polyisoprene, *cis*-polybutadiene, butadiene-isoprene rubber, styrene-isoprene rubber, styrene-isoprene-butadiene rubber, butyl rubber, neoprene, acrylonitrile-butadiene rubber, natural rubber, EPDM, terminal and backbone functionalized derivatives thereof, and mixtures thereof;

10 15 20 25 from about 1 to about 15 parts by weight of a difunctional crosslinking agent, per 100 parts by weight of the rubber, having the structure $Y_m(SRS)_nY_m$ where Y is selected from the group consisting of H, SR' and SiR'_3; where R is selected from the group consisting of branched and linear C2 to C20 alkylene, C6 to C20 arylene, C7 to C20 alkyarylene and C4 to C20 cycloalkylene groups and R"XR"; where R' is selected from the group consisting of branched and linear C1 to C10 alkyl, C6 to C10 aryl, C7 to C10 alkyaryl and C4 to C10 cycloalkyl groups; where R" is selected from the group consisting of branched and linear C2 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups and R" can be the same or different; where X is selected from the group consisting of O, S, NH, NR' and mixtures thereof; where m is 0 or 1 and n is 1 to about 100;

from 0 to 5 parts by weight of sulfur; and

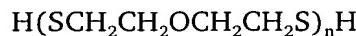
from about 0.2 to about 10 parts by weight of at least one accelerator.

25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 1230 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6235 6240 6245 6250 6255 6260 6265 6270 6275 6280 6285 6290 6295 6300 6305 6310 6315 6320 6325 6330 6335 6340 6345 6350 6355 6360 6365 6370 6375 6380 6385 6390 6395 6400 6405 6410 6415 6420 6425 6430 6435 6440 6445 6450 6455 6460 6465 6470 6475 6480 6485 6490 6495 6500 6505 6510 6515 6520 6525 6530 6535 6540 6545 6550 6555 6560 6565 6570 6575 6580 6585 6590 6595 6600 6605 6610 6615 6620 6625 6630 6635 6640 6645 6650 6655 6660 6665 6670 6675 6680 6685 6690 6695 6700 6705 6710 6715 6720 6725 6730 6735 6740 6745 6750 6755 6760 6765 6770 6775

to C10 cycloalkylene groups; where X is selected from the group consisting of O, S, NH, NR' and mixtures thereof and where R' is selected from the group consisting of branched and linear C1 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups.

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12. A rubber article, as set forth in claim 12, wherein said dimercaptan has the general formula



where n is 2 to 60.

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13. A rubber article, as set forth in claim 11, wherein said long chain difunctional crosslinking agent has a molecular weight of about 100 to about 10,000 g/mol.

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14. A rubber article, as set forth in claim 11, wherein said accelerators are selected from the group consisting of amines, guanidines, thioureas, thiols, thiurams, sulfonamides, dithiocarbamates and xanthates.

15. A pneumatic tire for use on wheeled vehicles having a component manufactured from a long chain crosslinked elastomeric composition of matter comprising:

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100 parts by weight of a rubber selected from the group consisting of polybutadiene, styrene-butadiene rubber, synthetic cis-1,4-polyisoprene, synthetic polyisoprene, cis-polybutadiene, butadiene-isoprene rubber, styrene-isoprene rubber, styrene-isoprene-butadiene rubber, butyl rubber, neoprene, acrylonitrile-butadiene rubber, natural rubber, EPDM, terminal and backbone functionalized derivatives thereof, and mixtures thereof;

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from about 1 to about 15 parts by weight of a difunctional crosslinking agent, per 100 parts by weight of the rubber, having the structure $\text{Y}_m(\text{SRS})_n\text{Y}_m$ where Y is selected from the group consisting of H, SR' and SiR'_3; where R is selected from the group consisting of branched and linear C2 to C20 alkylene, C6 to C20 arylene, C7 to C20 alkyarylene and C4 to C20 cycloalkylene groups and R"XR"; where R' is selected from the group consisting of branched and linear C1 to C10 alkyl, C6 to C10 aryl, C7 to C10 alkyaryl and C4 to C10

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cycloalkyl groups; where R" is selected from the group consisting of branched and linear C2 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups and R" can be the same or different; where X is selected from the group consisting of O, S, NH, NR' and mixtures thereof; where m is 0 or 1 and n is 1 to about 100;

5 from 0 to 5 parts by weight of sulfur; and

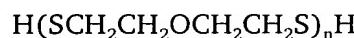
from about 0.2 to about 10 parts by weight of at least one accelerator.

16. A pneumatic tire, as set forth in claim 16, wherein said difunctional agent is a
10 dimercaptan having the general formula



where R is selected from the group consisting of branched and linear C2 to C20 alkylene, C6 to C20 arylene, C7 to C20 alkyarylene and C4 to C20 cycloalkylene groups and R"XR" where R" is selected from the group consisting of branched and linear C2 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups; where X is selected from the group consisting of O, S, NH, NR' and mixtures thereof and where R' is selected from the group consisting of branched and linear C1 to C10 alkylene, C6 to C10 arylene, C7 to C10 alkyarylene and C4 to C10 cycloalkylene groups.
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17. A pneumatic tire, as set forth in claim 17, wherein said dimercaptan has the
general formula



where n is 2 to 60.
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18. A pneumatic tire, as set forth in claim 16, wherein said long chain difunctional
crosslinking agent has a molecular weight of about 100 to about 10,000 g/mol.

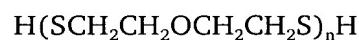
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- 30 19. A pneumatic tire, as set forth in claim 16, wherein said accelerators are selected
from the group consisting of amines, guanidines, thioureas, thiols, thiurams,
sulfonamides, dithiocarbamates and xanthates.

20. A pneumatic tire for use on wheeled vehicles having a component manufactured from a long chain crosslinked elastomeric composition of matter comprising:

100 parts by weight of a rubber selected from the group consisting of polybutadiene, styrene-butadiene rubber, synthetic *cis*-1,4-polyisoprene, synthetic polyisoprene, *cis*-polybutadiene, butadiene-isoprene rubber, styrene-isoprene rubber, styrene-isoprene-butadiene rubber, butyl rubber, neoprene, acrylonitrile-butadiene rubber, natural rubber, EPDM, terminal and backbone functionalized derivatives thereof, and mixtures thereof;

5 from about 1 to about 15 parts by weight of a dimercaptan, per 100 parts by weight of the rubber, having the general formula



10 where n is 2 to 60;

from 0 to 5 parts by weight of sulfur; and

from about 0.2 to about 10 parts by weight of at least one accelerator.

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